

matter is also directed to other embodiments having any other possible combination of the dependent features claimed below and those disclosed above. As such, the particular features presented in the dependent claims and disclosed above can be combined with each other in other manners within the scope of the disclosed subject matter such that the disclosed subject matter should be recognized as also specifically directed to other embodiments having any other possible combinations. Thus, the foregoing description of non-limiting example embodiments of the disclosed subject matter has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the disclosed subject matter to those embodiments disclosed herein.

What is claimed is:

1. An modular microphysiological system, comprising:
two or more inserts defining a well formed by a wall portion surround the well and a bottom portion, the bottom portion having an opening and a permeable membrane positioned across the opening; and
a platform having two or more chambers configured to receive said two or more inserts, wherein a flow channel is formed between the platform and the two or more inserts when inserts are inserted into said two or more chambers.
2. The modular microphysiological system of claim 1, wherein the two or more inserts further comprise an endothelial barrier formed from a layer of endothelial cells.
3. The modular microphysiological system of claim 2, wherein the endothelial barrier is adhered to the porous membrane.
4. The modular microphysiological system of claim 1 wherein the opening disposed at the bottom surface is about 8 mm by 4 mm.
5. The modular microphysiological system of claim 1, wherein the porous membrane comprises pores of about 20 μm .
6. The modular microphysiological system of claim 1, wherein a recess is defined in the wall portion configured to receive a sealing ring.
7. The modular microphysiological system of claim 1, wherein the platform further comprises a pump configured to circulate a vascular fluid in said flow channel.
8. The modular microphysiological system of claim 1, wherein the platform further includes an inlet reservoir and an outlet reservoir, and said flow channel is in fluid communication with the inlet reservoir and outlet reservoir.
9. The modular microphysiological system of claim 1, further comprising a rocker mechanism,
wherein the rocker mechanism includes a base plate and a pivot fixed to the base plate,
wherein the pivot is capable of limited rotation about the base.

10. The modular microphysiological system of claim 1, further including two or more tissues disposed in said two or more inserts, wherein the two or more tissues are selected from cardiac tissue, skin tissue, liver tissue, bone tissue, immune tissue, vascular tissue and lung tissue.

11. The modular microphysiological system of claim 10, wherein said two or more tissues are derived from induced pluripotent stem cells.

12. The modular microphysiological system of claim 11, wherein said induced pluripotent stem cells are derived from the same subject.

13. An integrated modular microphysiological system, comprising:

two or more inserts disposed in two or more chambers defined in a platform,

the two or more inserts defining a well formed by a wall portion surrounding the well and a bottom portion, the bottom portion having an opening and a permeable membrane positioned across the opening and an endothelial barrier disposed on the permeable membrane,

wherein a flow channel is formed between the platform and the two or more inserted inserts.

14. The integrated modular microphysiological system of claim 13, wherein the endothelial barrier of the two or more inserts is in fluid communication with the flow channel.

15. The integrated modular microphysiological system of claim 14, wherein the flow channel contains vascular fluid, and the system includes a fluid management system configured to circulate the vascular fluid at a defined shear rate.

16. The integrated modular microphysiological system of claim 13, wherein the channel is in fluid communication with at least one inlet or outlet, and each of said two or more inserts is in fluid communication with a media inlet flow path and a media outlet flow path.

17. The integrated modular microphysiological system of claim 13, further comprising a tissue in the two or more inserts, wherein the tissue is selected from cardiac tissue, skin tissue, liver tissue, bone tissue, immune tissue, vascular tissue and lung tissue.

18. The integrated modular microphysiological system of claim 17, wherein the tissue is derived from induced pluripotent stem cells.

19. The integrated modular microphysiological system of claim 18, wherein said induced pluripotent stem cells are derived from the same subject.

20. The modular microphysiological system of claim 13, further comprising a rocker mechanism configured to apply fluidic shear to the endothelial barrier,

wherein the rocker mechanism includes a base plate and a pivot fixed to the base plate,

wherein the pivot is capable of limited rotation about the base.

* * * * *